IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application : **10/056,492**

Applicant(s) : **LANGELAAR et al.**

Filed : **1/17/2002**

Confirmation : **5632**

T.C./Art Unit : **2131**

Examiner : **DOAN, Trang T.**

Atty. Docket : **NL-010062**

Title: **WATERMARKING A COMPRESSED INFORMATION SIGNAL**

Mail Stop: **APPEAL BRIEF - PATENTS**
Commissioner for Patents
Alexandria, VA 22313-1450

APPEAL UNDER 37 CFR 41.37

Sir:

This is an appeal from the decision of the Examiner dated 3 April 2007, finally rejecting claims 1-19 of the subject application.

This paper includes (each beginning on a separate sheet):

1. **Appeal Brief;**
2. **Claims Appendix;**
3. **Evidence Appendix; and**
4. **Related Proceedings Appendix.**

APPEAL BRIEF

I. REAL PARTY IN INTEREST

The above-identified application is assigned, in its entirety, to **Koninklijke Philips Electronics N. V.**

II. RELATED APPEALS AND INTERFERENCES

Appellant is not aware of any co-pending appeal or interference that will directly affect, or be directly affected by, or have any bearing on, the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-19 are pending in the application.

Claims 1-2, 6, 8-10, 14, and 16-18 stand rejected by the Examiner under 35 U.S.C. 102(e).

Claims 3-5, 7, 11-13, 15, and 19 stand rejected by the Examiner under 35 U.S.C. 103(a).

These rejected claims are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection in the Office Action dated 3 April 2007.

V. SUMMARY OF CLAIMED SUBJECT MATTER

This invention addresses watermarking a compressed information signal. In an example embodiment, the watermark signal is added in such a manner that the transmission bit rate generally decreases (Applicants' page 2, lines 1-3). Compression techniques generally use run-length encoding, wherein streams of repeating signal values are represented by the length of the repeating stream (FIG. 3B; page 3, lines 7-10). In an embodiment of this invention, the watermark information is added to the compressed information signal only if the addition of this information increases the length of a repeating stream, thereby increasing the compression efficiency of the run-length encoding (FIG. 3F; page 1, line 26 - page 2, line 3). Because conventional run-length encoders are generally optimized for encoding runs of zeros, the watermark information is preferably added only if the addition results in an increase in the number of zeros in the encoding (FIG. 3E; page 4, lines 11-14, lines 22-26), and because it is desirable that the watermark modifications are of minimal impact, the watermark information is added only if the information signal has the smallest value other than zero (e.g. +/- 1) (FIG. 3E; page 5, lines 16-19).

As claimed in independent claim 1, an embodiment of the invention comprises a method (FIGs. 3A-3G) of embedding a watermark (FIG. 3D) in an information signal (FIG. 3A) which is compressed so as to include first signal samples having a first value and second signal samples having a second value (page 4, lines 4-8), the method comprising the act of modifying at least one of the first and second signal samples in accordance with a watermark pattern to produce a modified signal sample (FIG. 3E; page 4, lines 8-11), wherein the act of modifying is applied to at least one of the first and second signal samples only if the modified signal sample equals zero (page 4, lines 11-14).

As claimed in dependent claim 2, an embodiment of the invention comprises the method as claimed in claim 1, wherein the first and second signal samples qualified for modification have the smallest value other than zero (FIG. 3E; page 5, lines 16-19).

As claimed in independent claim 8, an embodiment of the invention comprises a system (FIG. 1) for embedding a watermark (W; FIG. 3D) in an information signal (MPin; FIG. 3A)) which is compressed so as to include first signal samples having a first value and second signal samples having a second value (page 4, lines 4-8), the system comprising means for modifying (123) at least one of the first and second signal samples in accordance with a watermark pattern to produce a modified signal sample (page 4, lines 8-11), wherein the modifying means (123) are arranged to modify at least one of the first and second signal samples only if the modified signal sample equals zero (page 4, lines 11-14).

As claimed in independent claim 9, an embodiment of the invention comprises an application embodied on a computer readable medium (FIG. 1) configured to control a processor (120) to embed a watermark (W; FIG. 3D) in an information signal (MPin; FIG. 3A) which is compressed so as to include first signal samples having a first value and second signal samples having a second value (page 4, lines 4-8), the application comprising:

a portion (123) configured to modify at least one of the first and second signal samples in accordance with a watermark pattern to produce a modified signal sample (FIG. 3E, page 4, lines 8-11); and

a portion (123) configured to produce the modified signal sample only if the modified signal sample equals zero (page 4, lines 11-14).

As claimed in dependent claim 10, an embodiment of the invention comprises the application of claim 9, wherein the portion configured to produce the modified signal samples is configured to only modify the first and second signal samples having a smallest value other than zero (FIG. 3E; page 5, lines 16-19).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-2, 6, 8-10, 14, and 16-18 stand rejected under 35 U.S.C. 102(e) over Isnardi et al. (USP 6,037,984, hereinafter Isnardi).

Claims 3-5, 7, 11-13, 15, and 19 stand rejected under 35 U.S.C. 103(a) over Isnardi and Hartung et al. ("Digital Watermarking of MPEG-2 Coded Video In The Bitstream Domain", hereinafter Hartung).

VII. ARGUMENT

Claims 1-2, 6, 8-10, 14, and 16-18 stand rejected under 35 U.S.C. 102(e) over Isnardi

MPEP 2131 states:

> "A claim is anticipated only if ***each and every element*** as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The ***identical invention*** must be shown in as ***complete detail*** as is contained in the ... claim." *Richardson v. Suzuki Motor Co*., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claims 1, 2, and 6

Isnardi fails to teach modifying a signal sample in accordance with a watermark pattern ***only if*** the modified signal sample equals zero, as specifically claimed in claim 1, upon which claims 2-7 depend.

Isnardi teaches a watermarking method that includes an intermediate step of masking a signal sample before the watermark information is added to the masked signal sample:

> "The watermark mask 118 selects certain ones of the quantized DCT coefficients and sets the value of each selected coefficient to zero. A control signal, produced by the watermark generator, defines the particular coefficients that are to be masked. The masked array of coefficients containing the "zeroed" coefficients is coupled to the embedded decoder 116 and used to produce a predicted image.
> "The masked block of DCT coefficients is coupled to the watermark inserter 120, where the zeroed coefficients are replaced with watermark coefficients. The watermark coefficients are supplied by the watermark control signal." (Isnardi, column 4, lines 23-34.)

That is, as taught by Isnardi, all of the DCT coefficients corresponding to the watermark coefficients are set to zero, then the watermark information is added to these masked coefficients. That is, the watermark coefficients unconditionally replace the selected signal coefficients corresponding to the watermark.

The applicants respectfully maintain that the clause "***only if*** the modified signal sample equals zero" is a conditional clause that requires a determination of whether the modification will produce a zero value or a non-zero value. As taught in the example embodiment, the watermark coefficients are added to the signal coefficient, but the sum is only used in the modified signal if the sum equals zero; that is, the "***only if*** the modified signal sample equals zero" clause prevents non-zero sums being used in the modified signal.

Isnardi's intermediate masking step unconditionally forces each masked coefficient to zero. The applicants respectfully maintain that a method that forces all of the coefficients corresponding to a watermark to zero cannot reasonably be said to be ***identical*** to a method that conditionally applies the modification corresponding to a watermark only if such a modification produces a zero result, as required by MPEP 2131.

Because Isnardi's method is substantially different from the claimed method, and particularly because Isnardi fails to teach modifying a signal sample in accordance with a watermark pattern ***only if*** the modified signal sample equals zero, as specifically claimed in claim 1, the applicants respectfully maintain that the rejection of claims 1, 2, and 6 under 35 U.S.C. 102(e) over Isnardi is unfounded, per MPEP 2131, and should be reversed by the Board.

Claim 8

Claim 8 claims a system that includes modifying means that are arranged to modify a signal sample in accordance with a watermark pattern only if the modified signal sample equals zero.

As noted above, Isnardi fails to teach modifying a signal sample in accordance with a watermark pattern only if the modified signal sample equals zero, as specifically claimed in claim 8. Accordingly, the applicants respectfully maintain that the rejection of claim 8 under 35 U.S.C. 102(e) over Isnardi is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 9-10, 14, and 16-18

Claim 9, upon which claims 10-18 depend, claims an application that is configured to modify a signal sample in accordance with a watermark pattern to produce a modified signal sample only if the modified signal sample equals zero.

As noted above, Isnardi fails to teach modifying a signal sample in accordance with a watermark pattern only if the modified signal sample equals zero, as specifically claimed in claim 8. Accordingly, the applicants respectfully maintain that the rejection of claims 9-10, 14, and 16-18 under 35 U.S.C. 102(e) over Isnardi is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 2 and 10

Isnardi fails to teach limiting the samples qualified for modification to those that have the smallest value other than zero, as specifically claimed in claims 2 and 10.

As noted above, Isnardi unconditionally applies a mask to the signal samples based on the watermark pattern, then adds the watermark information to the masked sample. Isnardi does not teach that the masking and subsequent addition is dependent upon the value of the signal samples, and therefore cannot be said to teach limiting the modification to those samples that have the smallest value other than zero.

The Examiner asserts that Isnardi teaches this limitation at column 5, lines 55-62:

> "At step 212, the routine 200 replaces the selectively zeroed coefficients with watermark values (i.e., quantized DCT coefficients derived from a watermark image). Care must be taken in selecting DCT coefficients for replacement. If the watermark is to have low visibility, then it is critical that relatively small watermark DCT values, e.g., -1, 0, +1, be inserted into the locations carrying the highest frequency coefficients of the DCT."

As can be seen, at the cited text, Isnardi addresses the value of the watermark coefficients, which are independent of the values of the signal samples.

Because Isnardi does not limit the samples qualified for modification based on their magnitude, and specifically does not limit the samples qualified for modification to those that have the smallest value other than zero, the applicants respectfully maintain that the rejection of claims 2 and 10 under 35 U.S.C. 102(e) over Isnardi is unfounded, per MPEP 2131, and should be reversed by the Board.

Claims 3-5, 7, 11-13, 15, and 19 stand rejected under 35 U.S.C. 103(a) over Isnardi and Hartung

MPEP 2142 states:

> "To establish a *prima facie* case of obviousness … the prior art reference (or references when combined) ***must teach or suggest all the claim limitations***… If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness."

Claims 3-5, 7, 11-13, 15, and 19

Each of these rejected claims is dependent upon claim 1 or claim 9. In this rejection, the Examiner relies upon Isnardi for teaching the elements of claims 1 and 9.

As noted above, Isnardi fails to teach each of the elements of claims 1 and 9. Accordingly, the applicants respectfully maintain that the rejection of claims 3-5, 7, 11-13, 15, and 19 under 35 U.S.C. 103(a) that relies on Isnardi for this teaching is unfounded, per MPEP 2142, and should be reversed by the Board.

CONCLUSIONS

Because Isnardi fails to teach modifying a signal sample in accordance with a watermark pattern only if the modified signal sample equals zero, the applicants respectfully request that the Examiner's rejection of claims 1-2, 6, 8-10, 14, and 16-18 under 35 U.S.C. 102(e), and claims 3-5, 7, 11-13, 15, and 19 under 35 U.S.C. 103(a), be reversed by the Board, and the claims be allowed to pass to issue.

Because Isnardi does not limit the samples qualified for modification based on their magnitude, and specifically does not limit the samples qualified for modification to those that have the smallest value other than zero, the applicants respectfully request that the Examiner's rejection of claims 2 and 10 under 35 U.S.C. 102(e) be reversed by the Board, and the claims be allowed to pass to issue.

Respectfully submitted

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CLAIMS APPENDIX

1. A method of embedding a watermark in an information signal which is compressed so as to include first signal samples having a first value and second signal samples having a second value, the method comprising the act of modifying at least one of the first and second signal samples in accordance with a watermark pattern to produce a modified signal sample, wherein the act of modifying is applied to at least one of the first and second signal samples only if the modified signal sample equals zero.

2. The method as claimed in claim 1, wherein the first and second signal samples qualified for modification have the smallest value other than zero.

3. The method as claimed in claim 1, wherein the first and second signal samples have been quantized with a quantizer step size, and the first and second signal samples qualified for modification are signal samples being quantized with a step size which is less than a predetermined threshold.

4. The method as claimed in claim 1, wherein the information signal is divided into sections and the number of the first and second signal samples qualified for modification is limited to a predetermined maximum per section.

5. A method as claimed in claim 4, wherein the first and second signal samples of a section have been quantized in accordance with a quantizer step scale, the method including the act of controlling said maximum of modified signal samples in dependence upon said quantizer step scale.

6. A method as claimed in claim 1, wherein the information signal is divided into sections and the first and second signal samples of a section have been quantized in accordance with a quantizer step scale, the method including the act of controlling a position of the first and second signal samples qualified for modification within a section in dependence upon said quantizer step scale.

7. The method as claimed in claim 1, wherein the compressed signal includes variable-length code words each identifying a run of the first and second signal samples, the method further comprising the acts of:

decoding the variable-length code words into respective first and second signal samples prior to said modifying act;

merging the modified signal sample with succeeding or preceding first signal samples to obtain a new run of first signal samples, and

encoding the new run of first and second signal samples into a new variable-length code word.

8. A system for embedding a watermark in an information signal which is compressed so as to include first signal samples having a first value and second signal samples having a second value, the system comprising means for modifying at least one of the first and second signal samples in accordance with a watermark pattern to produce a modified signal sample, wherein the modifying means are arranged to modify at least one of the first and second signal samples only if the modified signal sample equals zero.

9. An application embodied on a computer readable medium configured to control a processor to embed a watermark in an information signal which is compressed so as to include first signal samples having a first value and second signal samples having a second value, the application comprising:

a portion configured to modify at least one of the first and second signal samples in accordance with a watermark pattern to produce a modified signal sample; and

a portion configured to produce the modified signal sample only if the modified signal sample equals zero.

10. The application of Claim 9, wherein the portion configured to produce the modified signal samples is configured to only modify the first and second signal samples having a smallest value other than zero.

11. The application of Claim 9, comprising a portion configured to quantize the first and second signal samples with a quantizer step size, wherein the portion configured to produce the modified signal samples is configured to only modify the first and second signal samples quantized with a step size which is less than a predetermined threshold.

12. The application of Claim 9, comprising a portion configured to divide the first and second signal samples into sections, wherein the portion configured to produce the modified signal samples is configured to only modify a predetermined number of the first and second signal samples per section.

13. The application of Claim 12, comprising a portion configured to quantize the first and second signal samples with a quantizer step scale, wherein the portion configured to produce the modified signal samples is configured to modify the first and second signal samples in dependence upon the quantizer step scale.

14. The application of Claim 9, comprising:

a portion configured to divide the first and second signal samples into sections; and

a portion configured to quantize the first and second signal samples with a quantizer step scale, wherein the portion configured to produce the modified signal samples is configured to control a position of the first and second signal samples modified within a section in dependence upon the quantizer step scale.

15. The application of Claim 9, wherein the compressed signal includes variable-length code words each identifying a run of the first and second signal samples, the application further comprising:

a portion configured to decode the variable-length code words into respective first and second signal samples prior to producing the modified signal samples;

a portion configured to merge the modified signal samples with the first and second signal samples to obtain a new run of the first and second signal samples, and

a portion configured to encode the new run of the first and second signal samples into a new variable-length code word.

16. The application of Claim 9, wherein the watermark is represented by DCT coefficients and the portion configured to modify the first and second signal samples is configured to modify the first and second signal samples in accordance with a corresponding sign of the watermark DCT coefficients.

17. The application of Claim 16, wherein the first and second signal samples are represented by DCT coefficients and the portion configured to modify the first and second signal samples is configured to modify a range of signal sample DCT coefficients in accordance with the corresponding sign of the watermark DCT coefficients.

18. The application of Claim 9, wherein the watermark is represented by DCT coefficients and the portion configured to modify the signal samples is configured to modify the signal samples in accordance with only a plurality of most significant DCT coefficients.

19. The application of Claim 9, wherein the information signal contains field-coded DCT blocks and frame-coded DCT blocks, and wherein the portion configured to modify signal samples is configured to modify field-coded DCT blocks with a first watermark and is configured to modify frame-coded DCT blocks with a second watermark.

EVIDENCE APPENDIX

No evidence has been submitted that is relied upon by the appellant in this appeal.

RELATED PROCEEDINGS APPENDIX

Appellant is not aware of any co-pending appeal or interference which will directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.